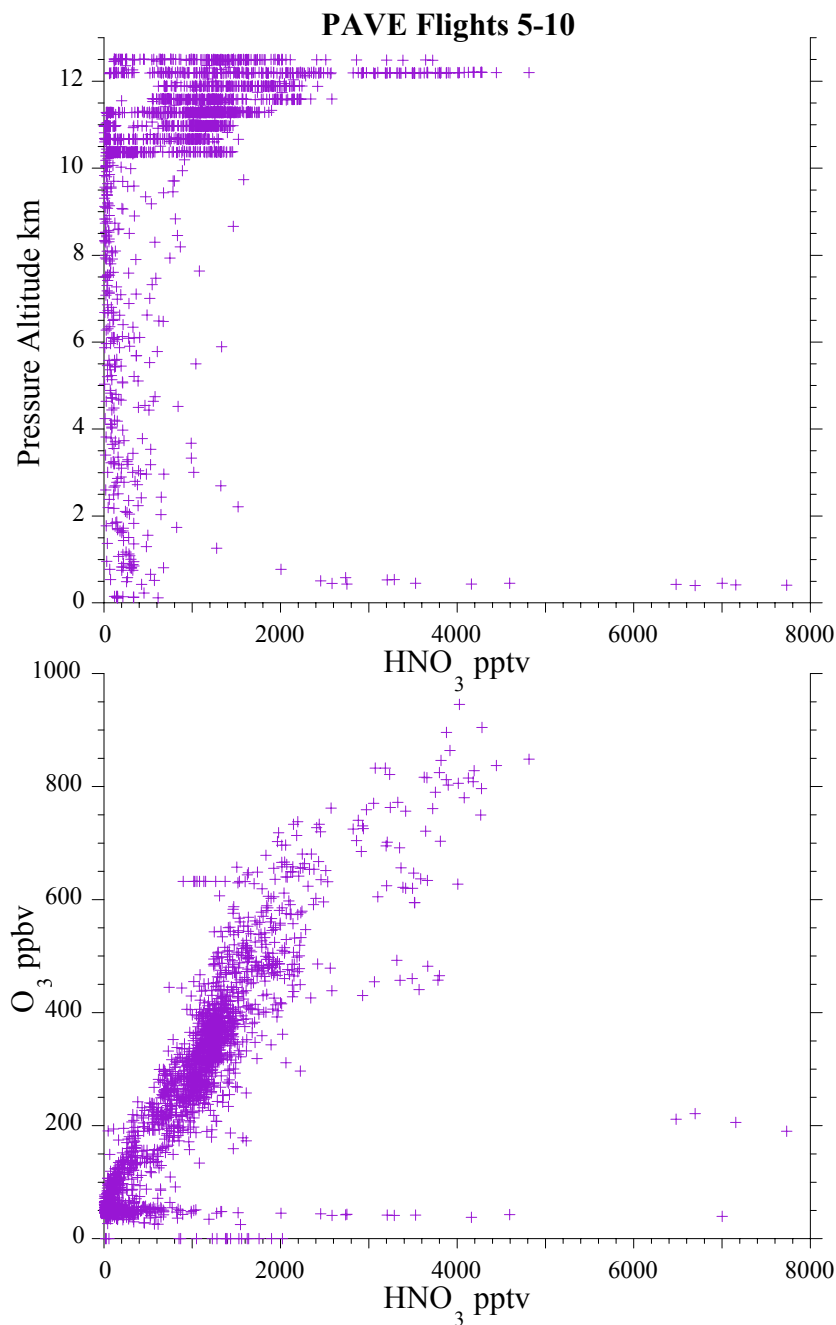


# Comparison of UNH In-Situ $\text{HNO}_3$ During PAVE and INTEX B to MLS and TES Retrievals

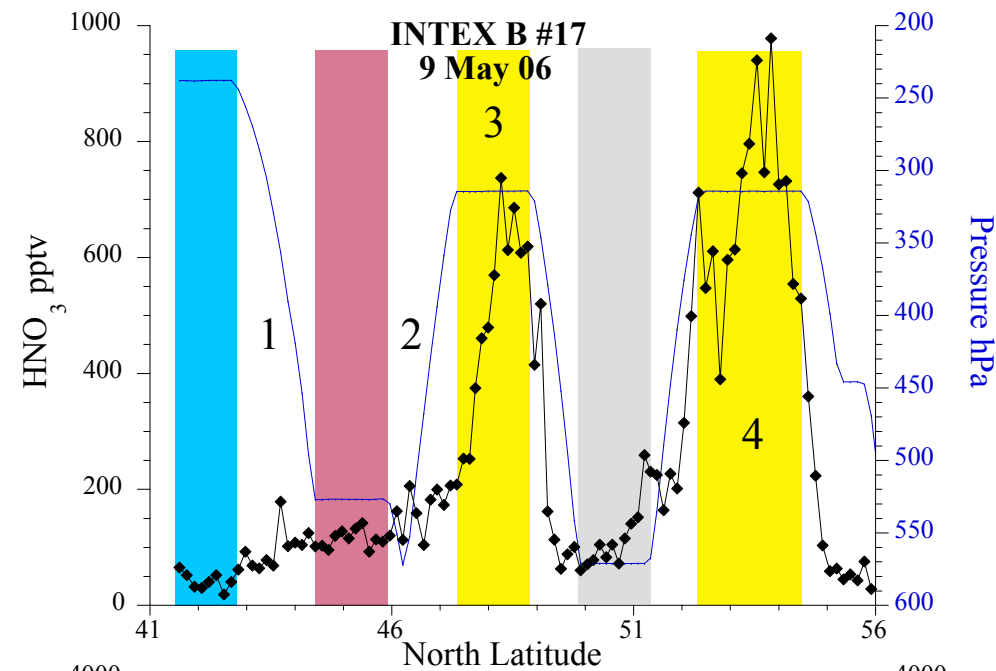
Jack Dibb  
Eric Scheuer  
Michelle Santee and the MLS Team  
Susan Kulawik and the TES Team



UNH SAGA makes insitu measurements of HNO<sub>3</sub> with mist chamber samplers and near-real-time ion chromatographic analysis.

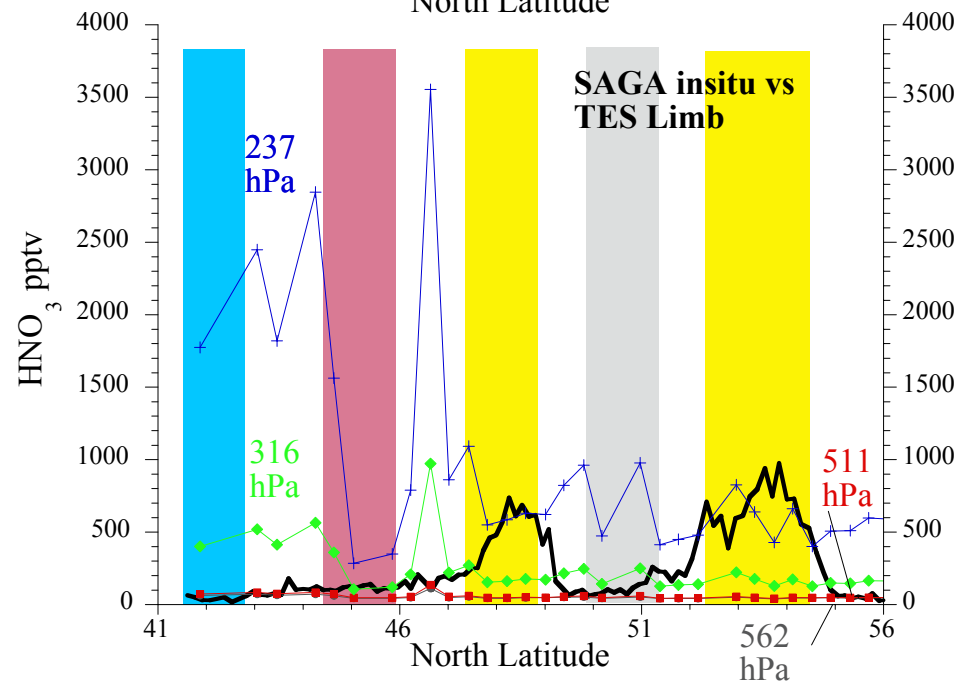
For PAVE resolution was approx. 100 seconds. Flight plans clearly emphasized UT/LS, usually at the ceiling of the DC-8.

During INTEx B resolution improved to 80 sec. Preliminary data just submitted, so have just begun any scientific analysis. MILAGRO workshop will inspire focus on first phase!

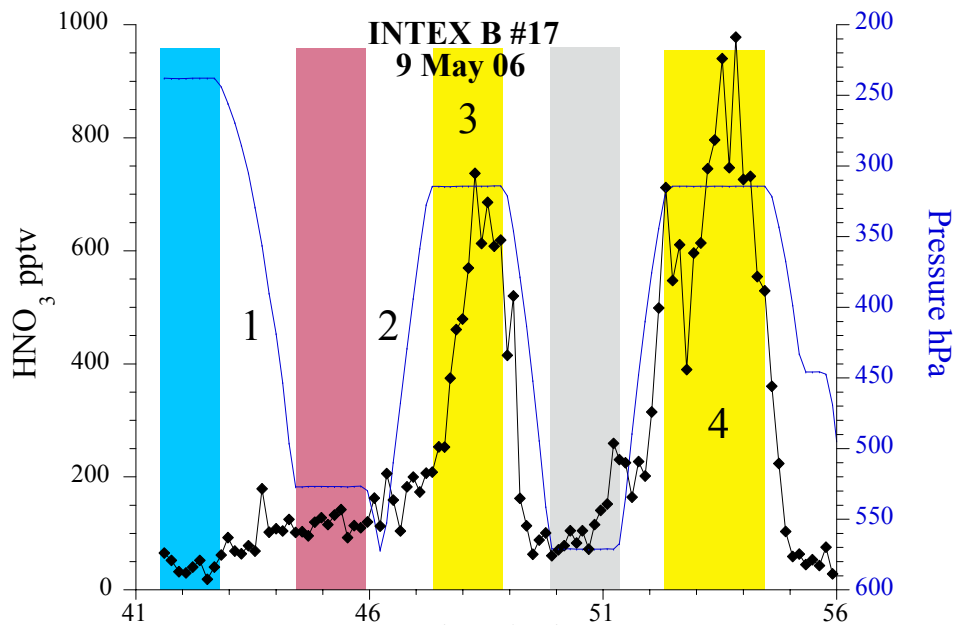


TES Limb retrieval. Many pressure levels. Susan tried again to explain proper way to compare.

Instead, I have chosen here to look at retrieval levels close to the 4 constant altitude flight levels.



This flight from Anchorage very interesting from the DC-8 view point. May also be useful to validate MLS (but this date has not yet been run with V2.1).

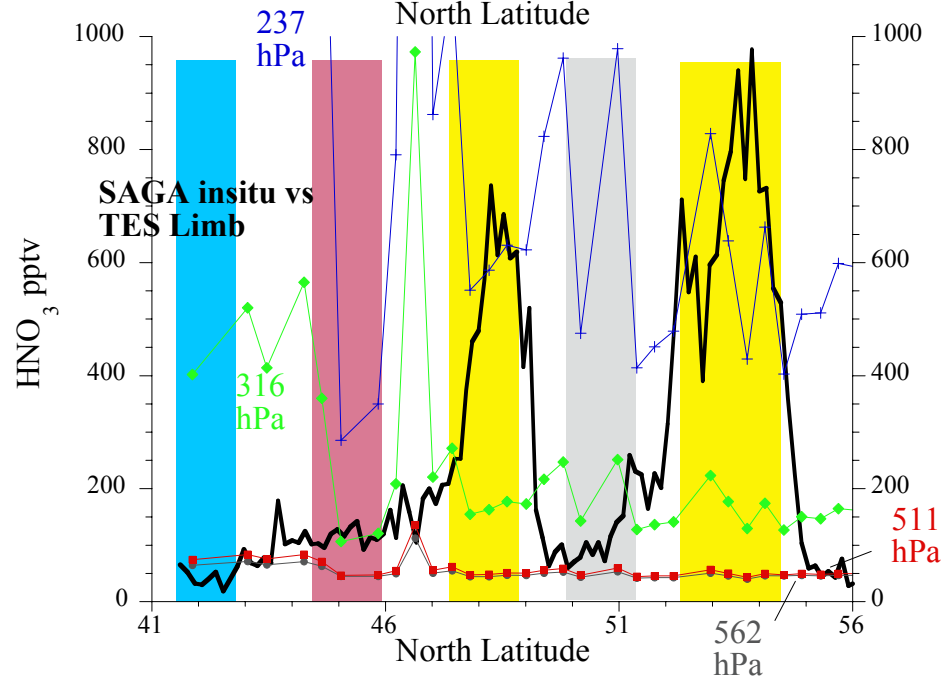


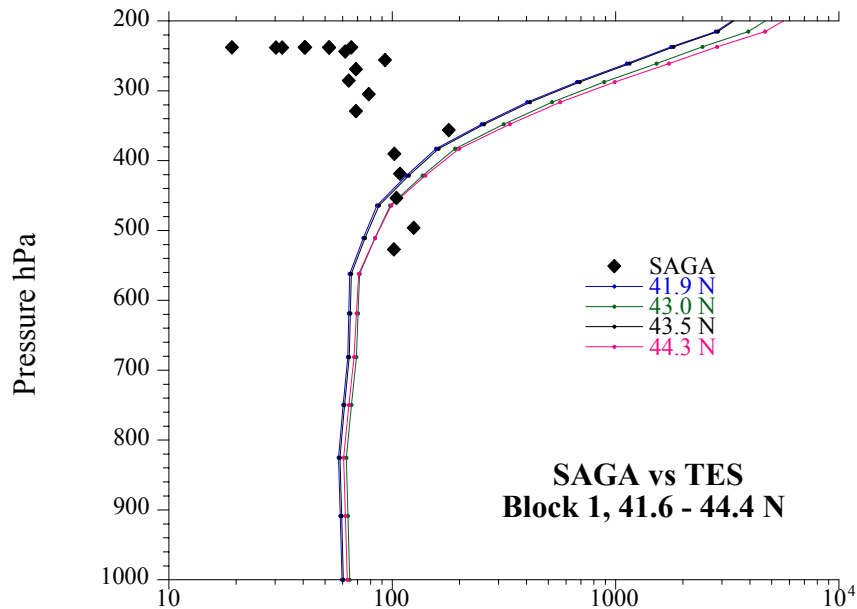
Same flight and plot as previous, except the lower panel has been rescaled to emphasize the retrievals at pressures greater than 300 hPa.

Not much difference between 511 and 562 hPa.

Note the spike at all retrieved pressure levels near 46.5 N.

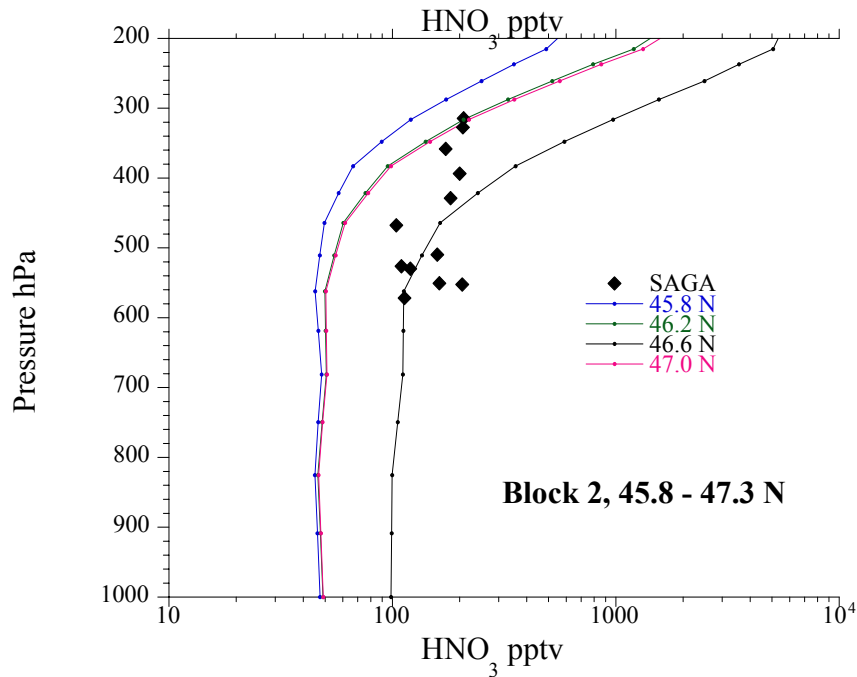
Also note the labeled blocks 1 - 4, first 2 are short profiles and last 2 are constant altitude legs with significant variation in the SAGA data.

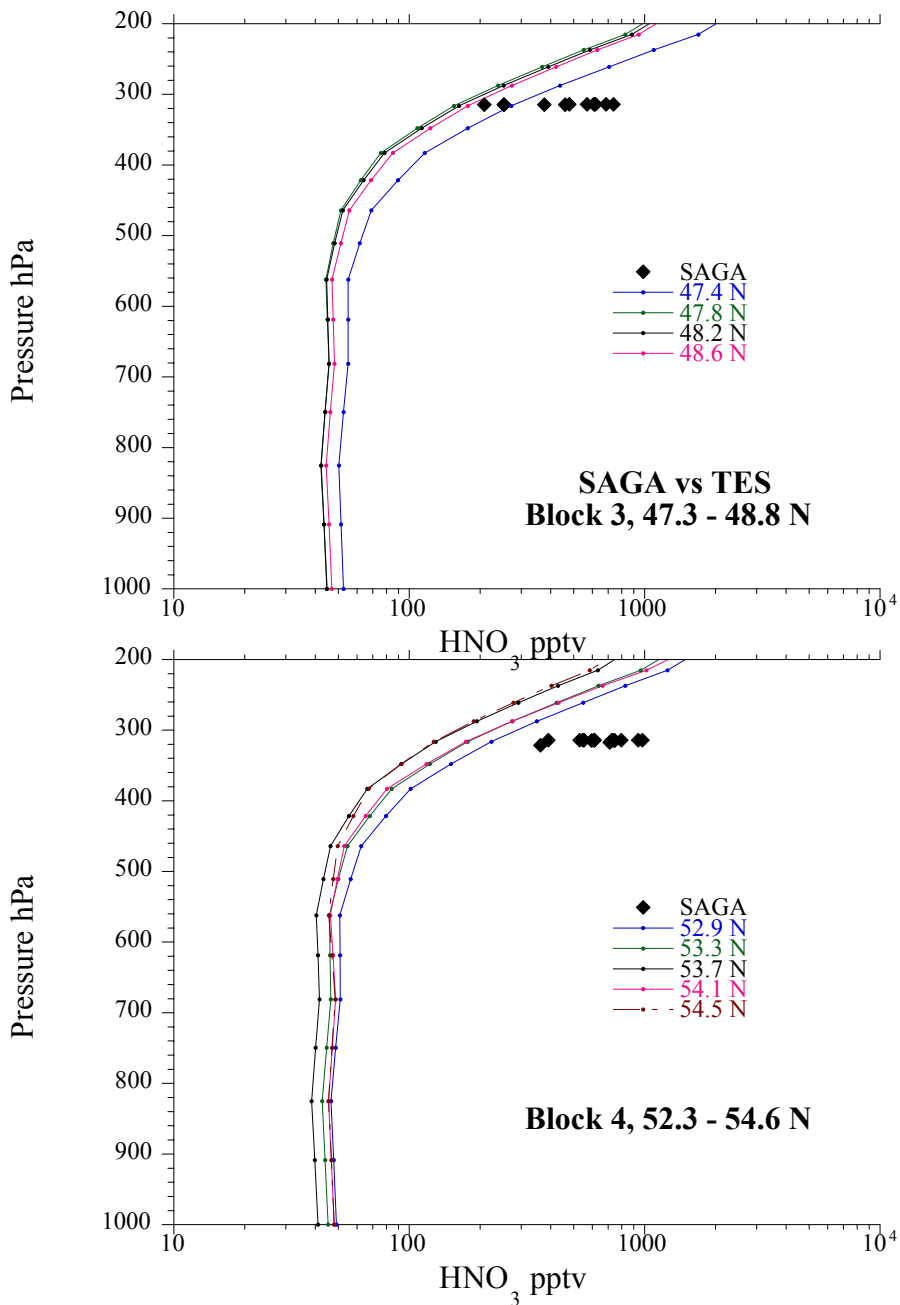




Tropopause seems to be too low in TES profiles, especially at southern end.

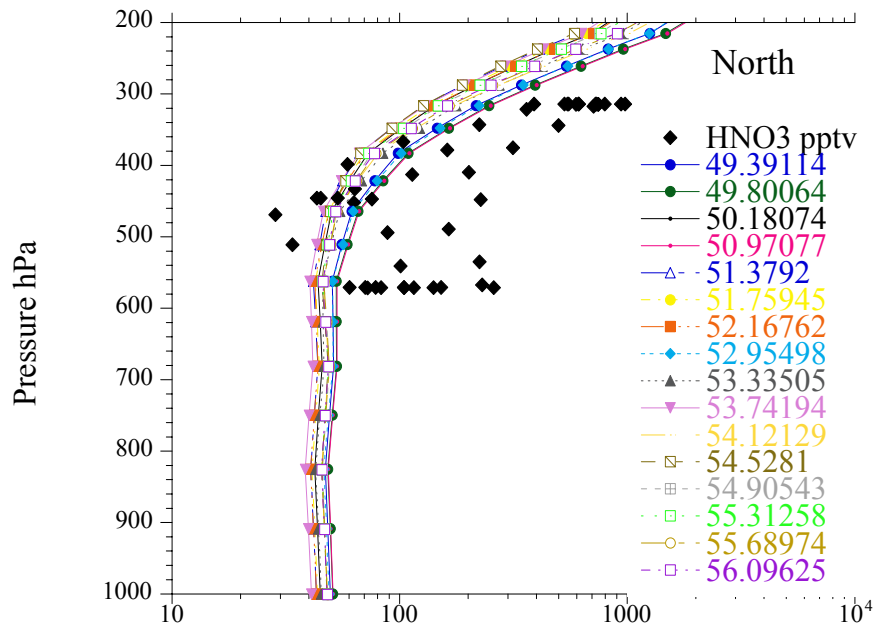
The retrieved profile at 46.6 N “closer” to SAGA in mid troposphere. This is same profile noted as unusual in previous plot.





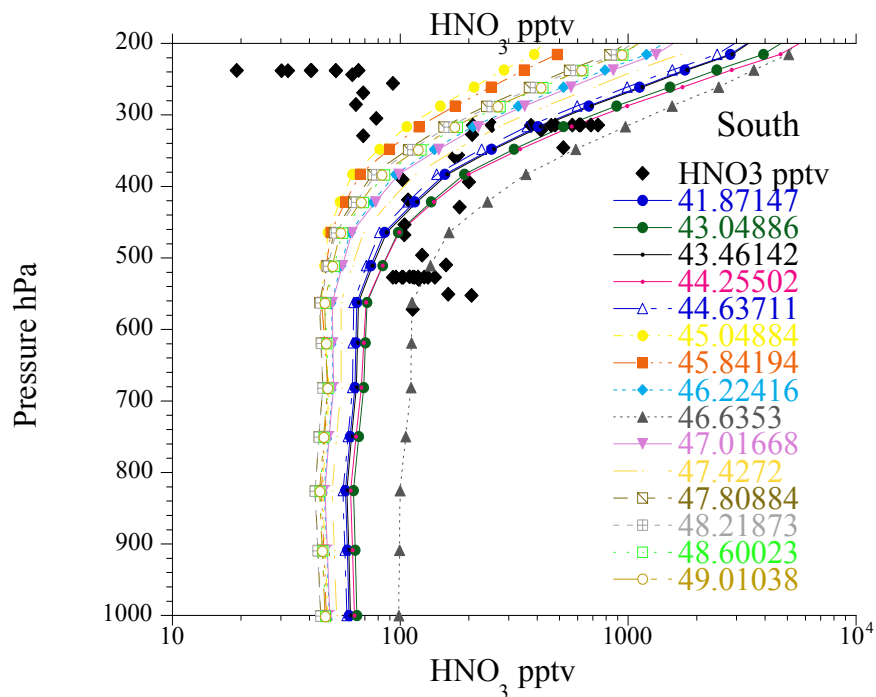
North of about 48 N, TES profiles all tend to have the tropopause too high.

Also little structure in the retrievals at pressures above 500 hPa (but also little insitu data to compare too).

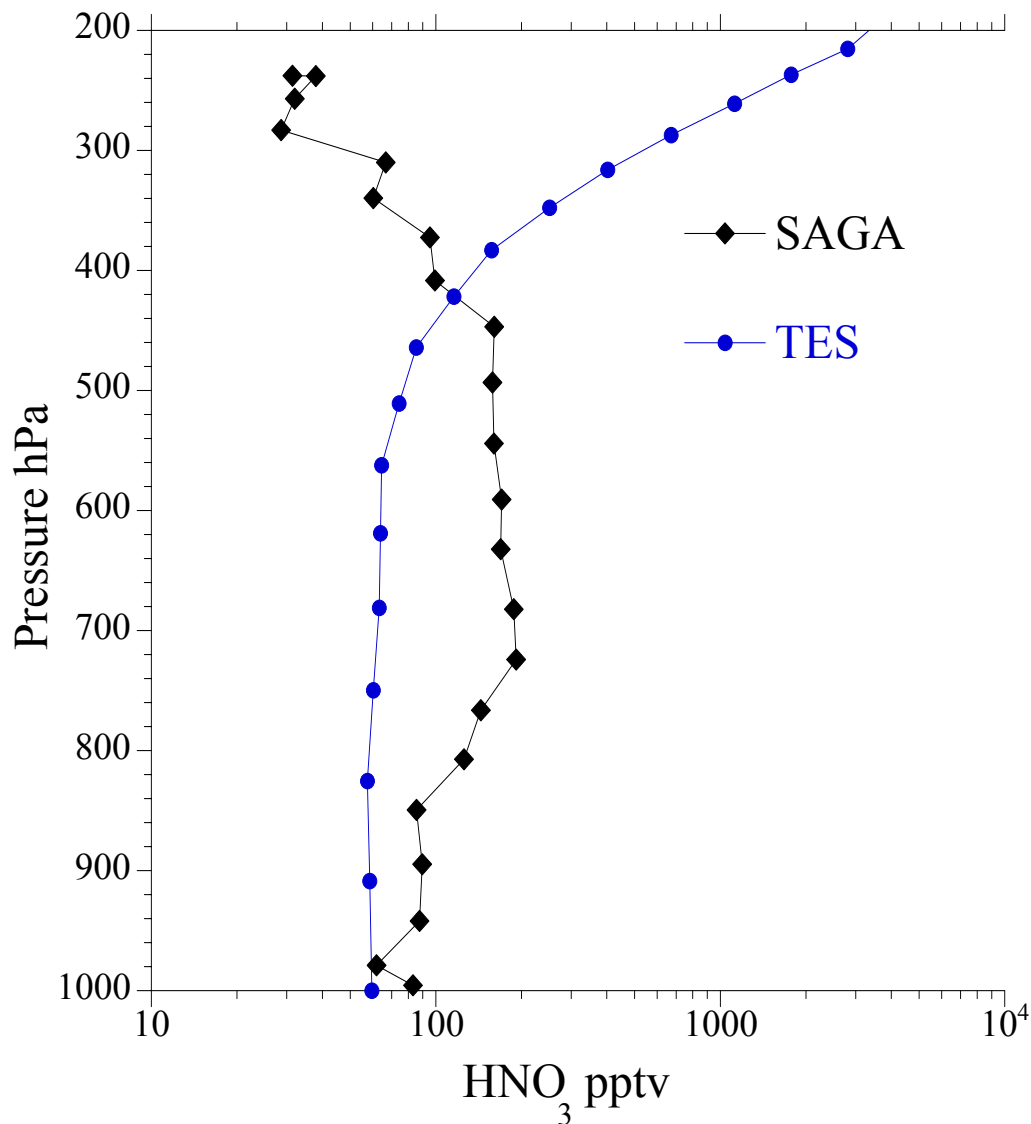


Here are all of the TES profiles along the intercomparison track.

Split into 2 groups at about 49 N just because the plotting program would not allow more than 20, but SAGA data are split same way.



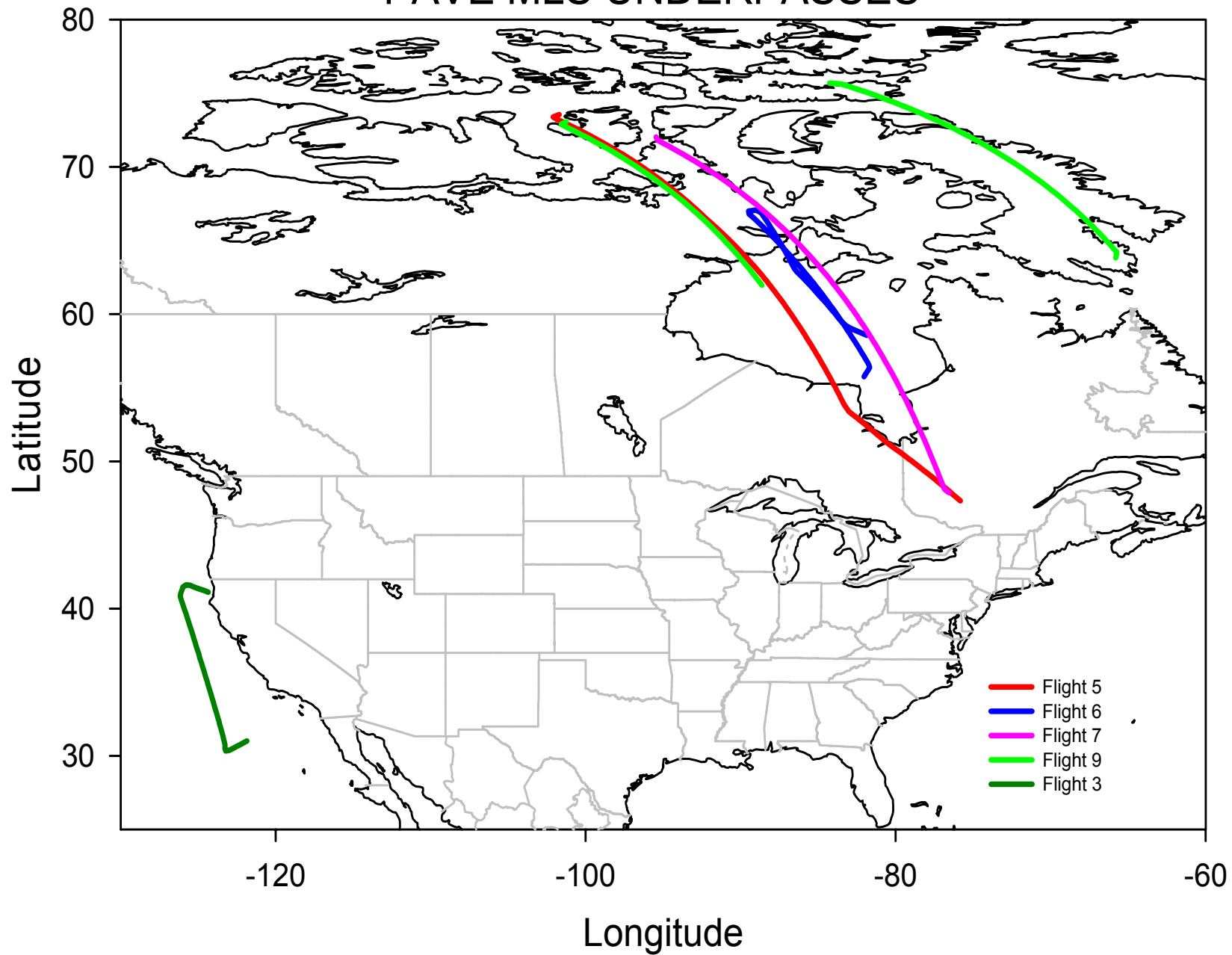
Supports previous comments about TES tropopause level, boring mid- and lower-troposphere, and really pulls out the profile at 46.6 N as unique.

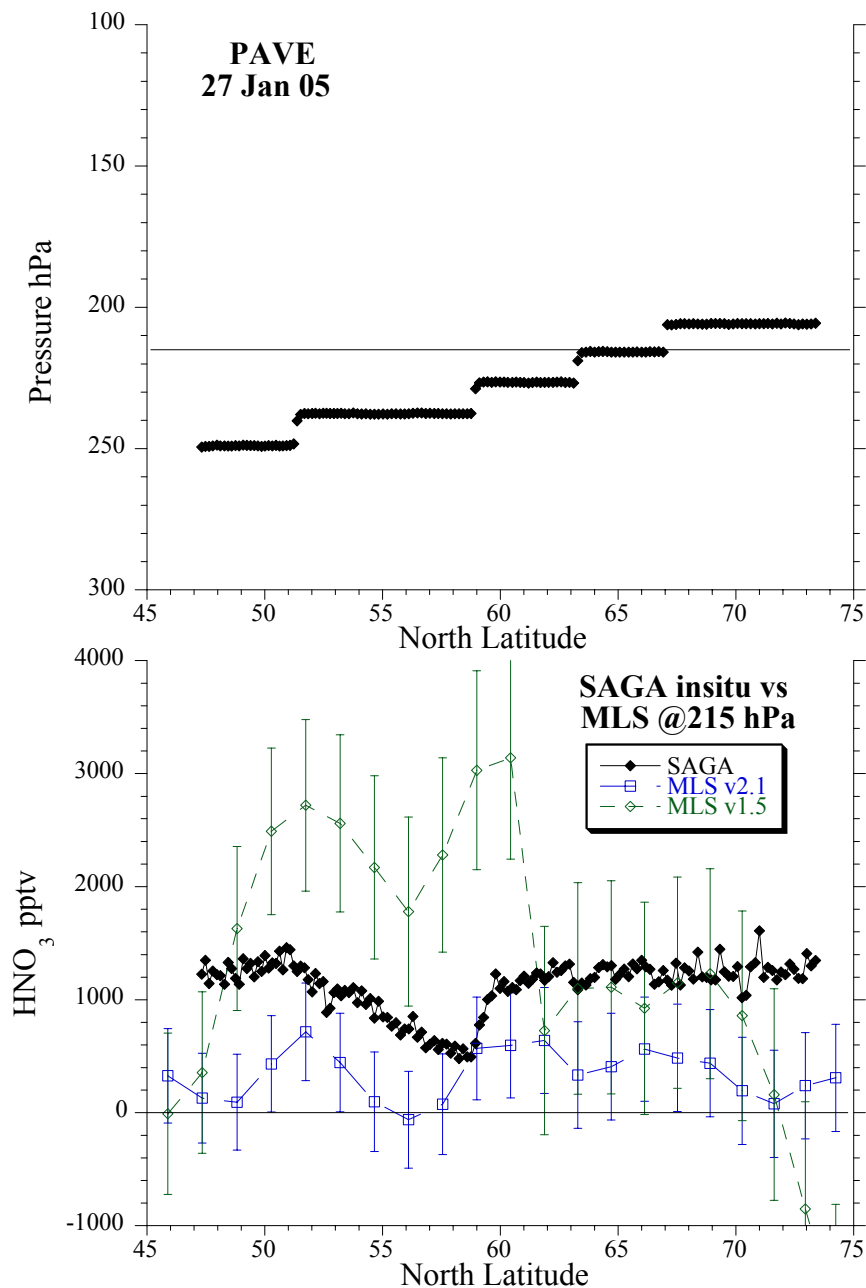


After the long leg on the TES limb track, DC-8 shifted east and did a spiral intended to be at a TES nadir point (approx 42 N, 138 W).

Plot compares insitu measurements from the DC-8 profile to the TES limb retrieval at 42 N (some offset to the east)

# PAVE MLS UNDERPASSES



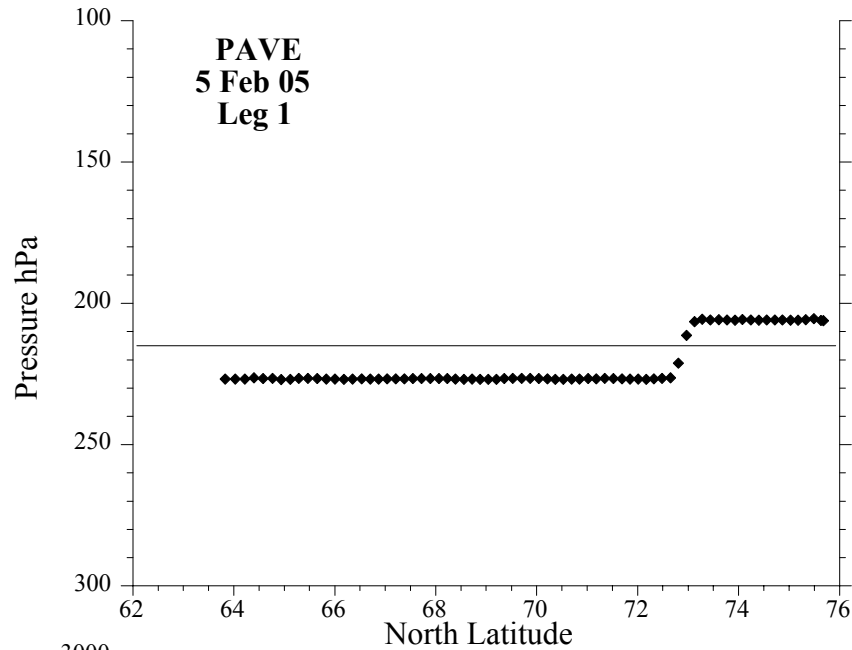


MLS team has reprocessed 2 of the PAVE days with V2.1 so far.

Previous assessment was that the retrieval (V1.5) at 215 hPa was “not recommended for scientific use”.

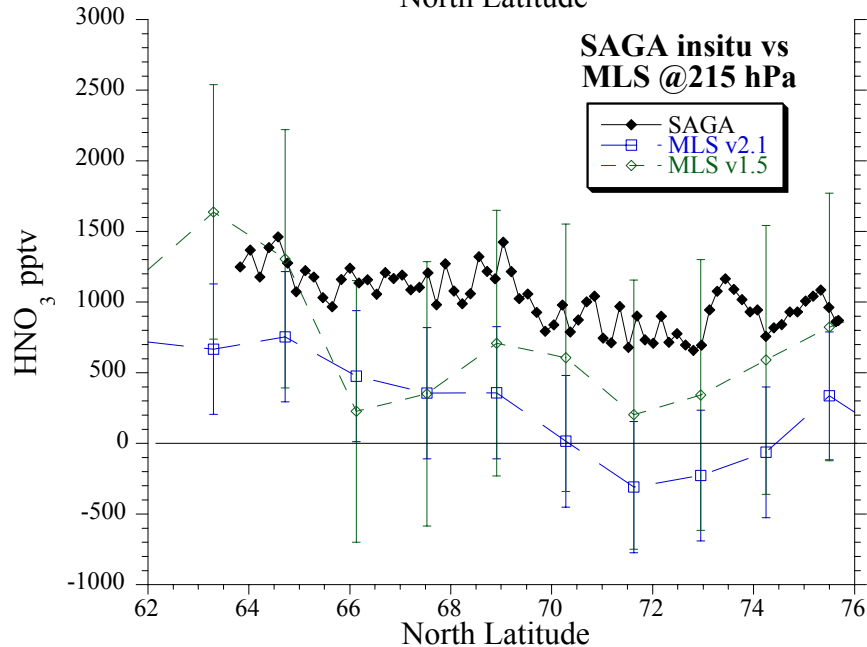
In this case, V2.1 seems to agree with SAGA spatial trend better, but is a little low in mixing ratios.

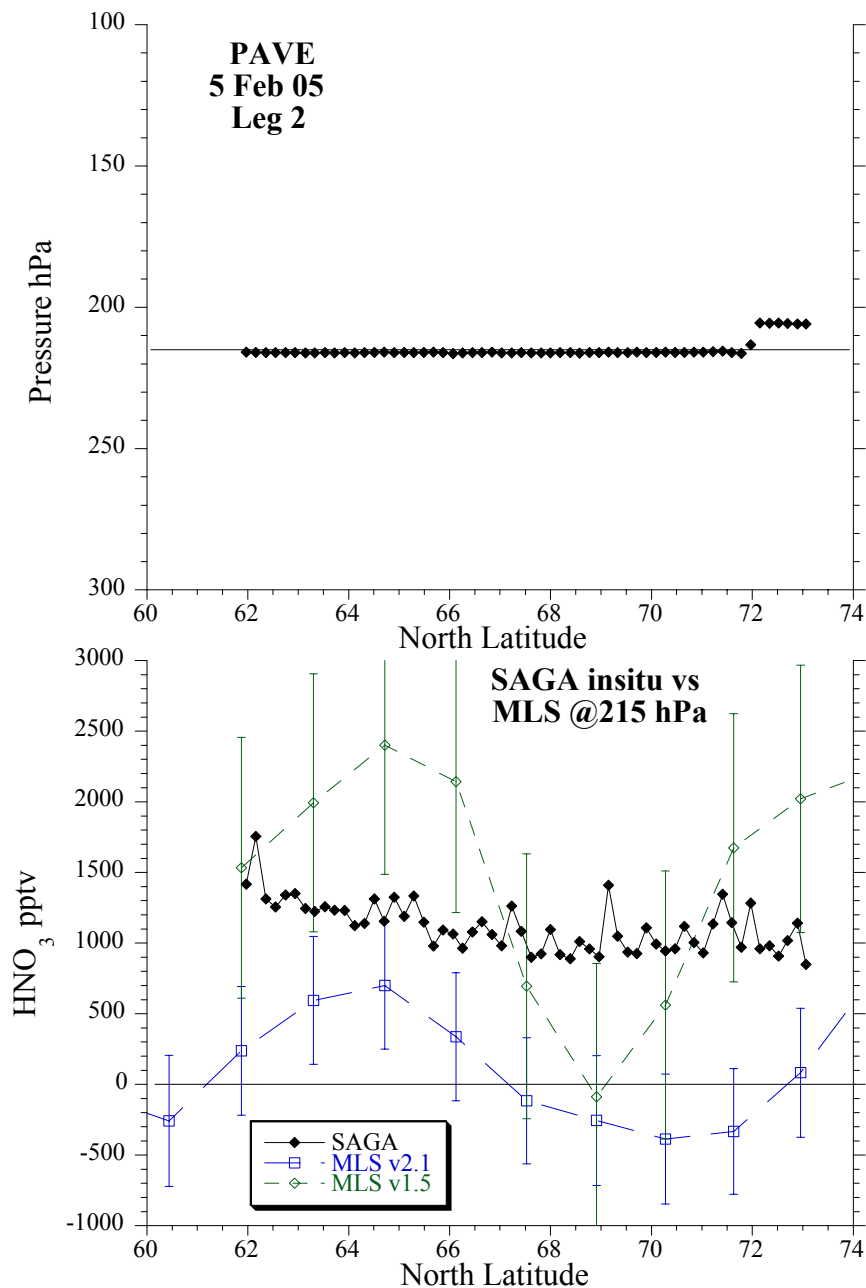
**PAVE  
5 Feb 05  
Leg 1**



Here too, V2.1 shows smoother changes, more like the insitu observations.

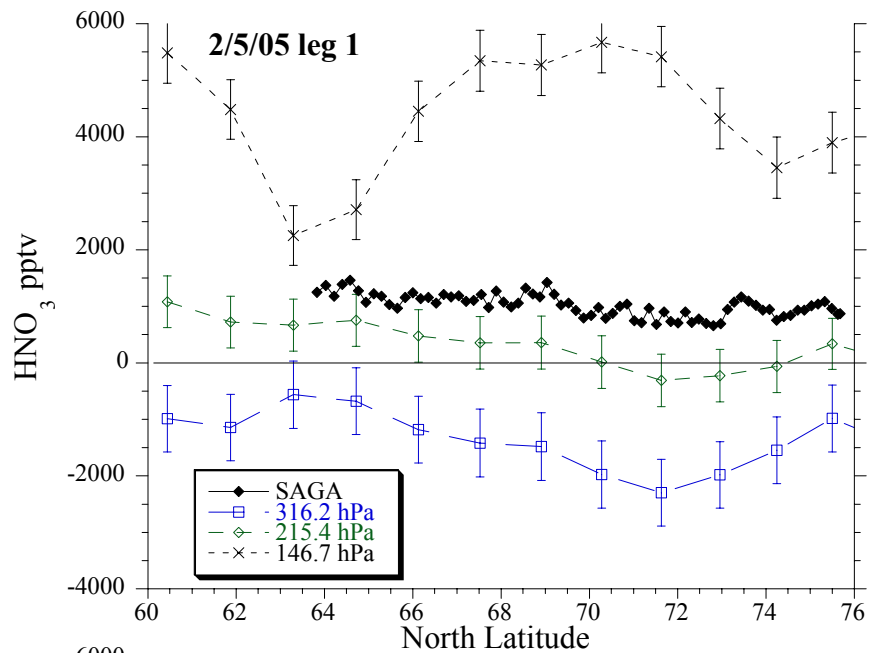
However, both versions tend to be lower than SAGA data, and V2.1 tends to be lower than V1.5.





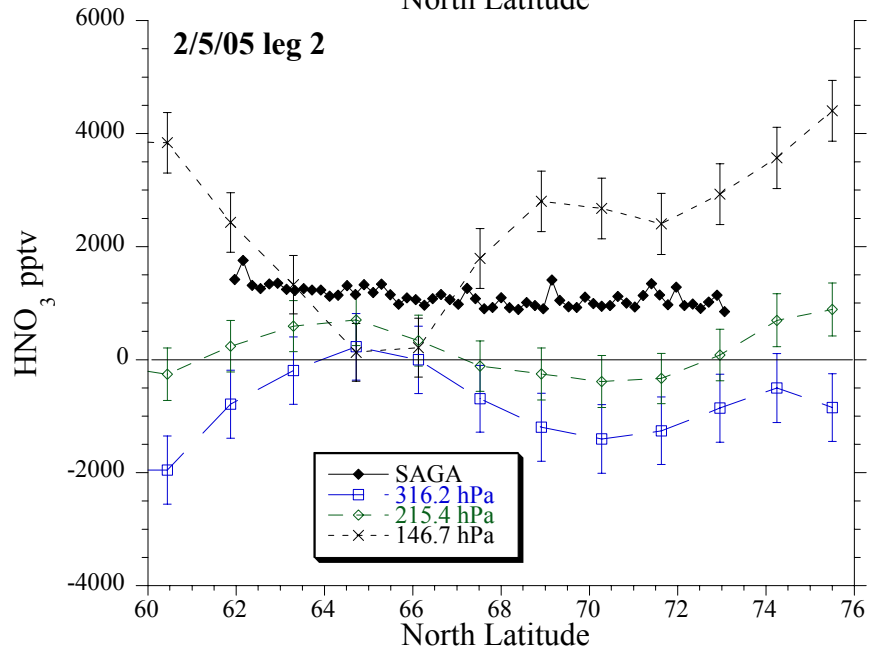
Same DC-8 flight, next orbit of Aura. MLS is seeing structure that was not apparent at flight level.

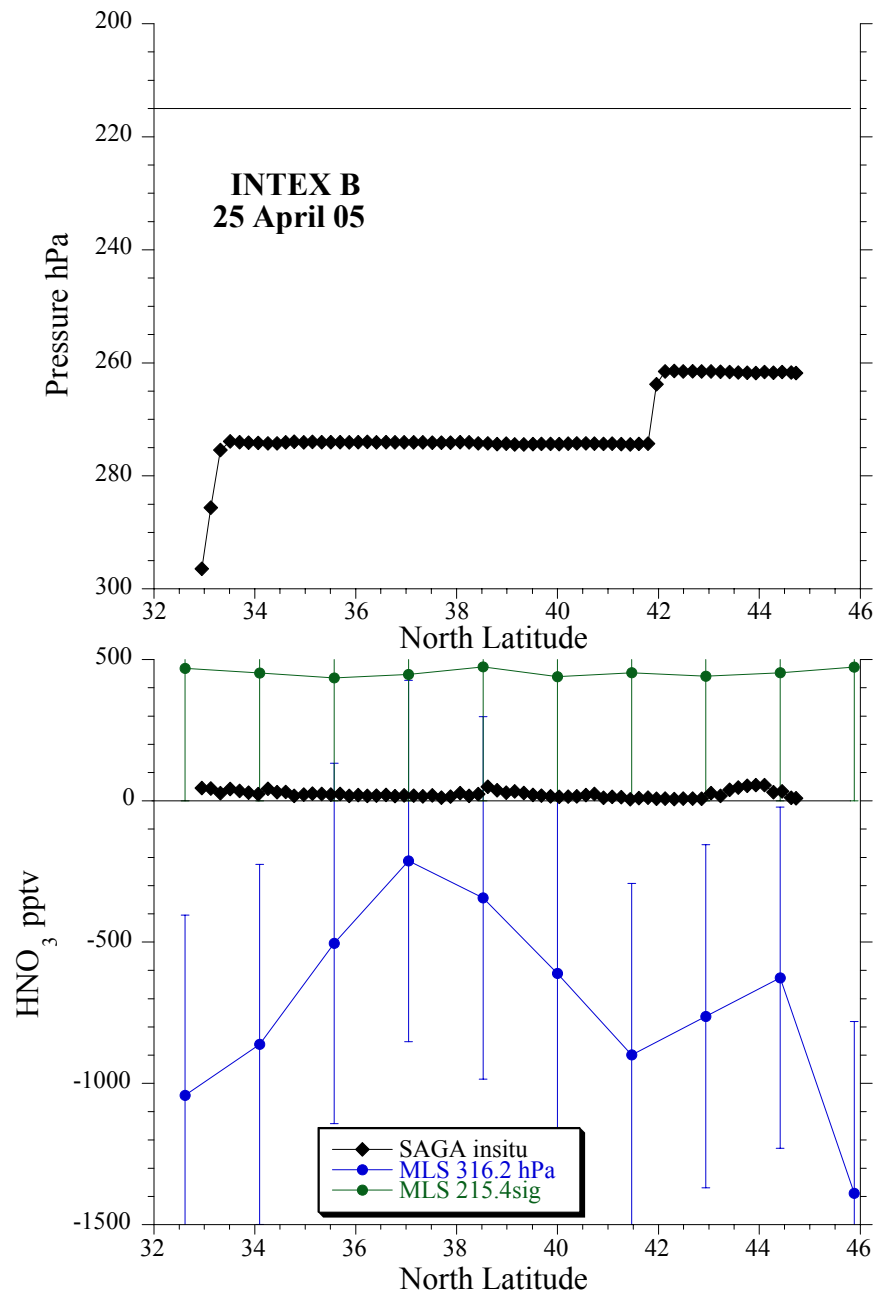
Observations tend to be between the 2 versions, with V2.1 lowest again.



Could depletion of  $\text{O}_3$  and  $\text{HNO}_3$  above the airplane be causing problems for the retrievals at 215 and 316 hPa?

Note that MLS returns decidedly negative  $\text{HNO}_3$  along these legs at 316 hPa.

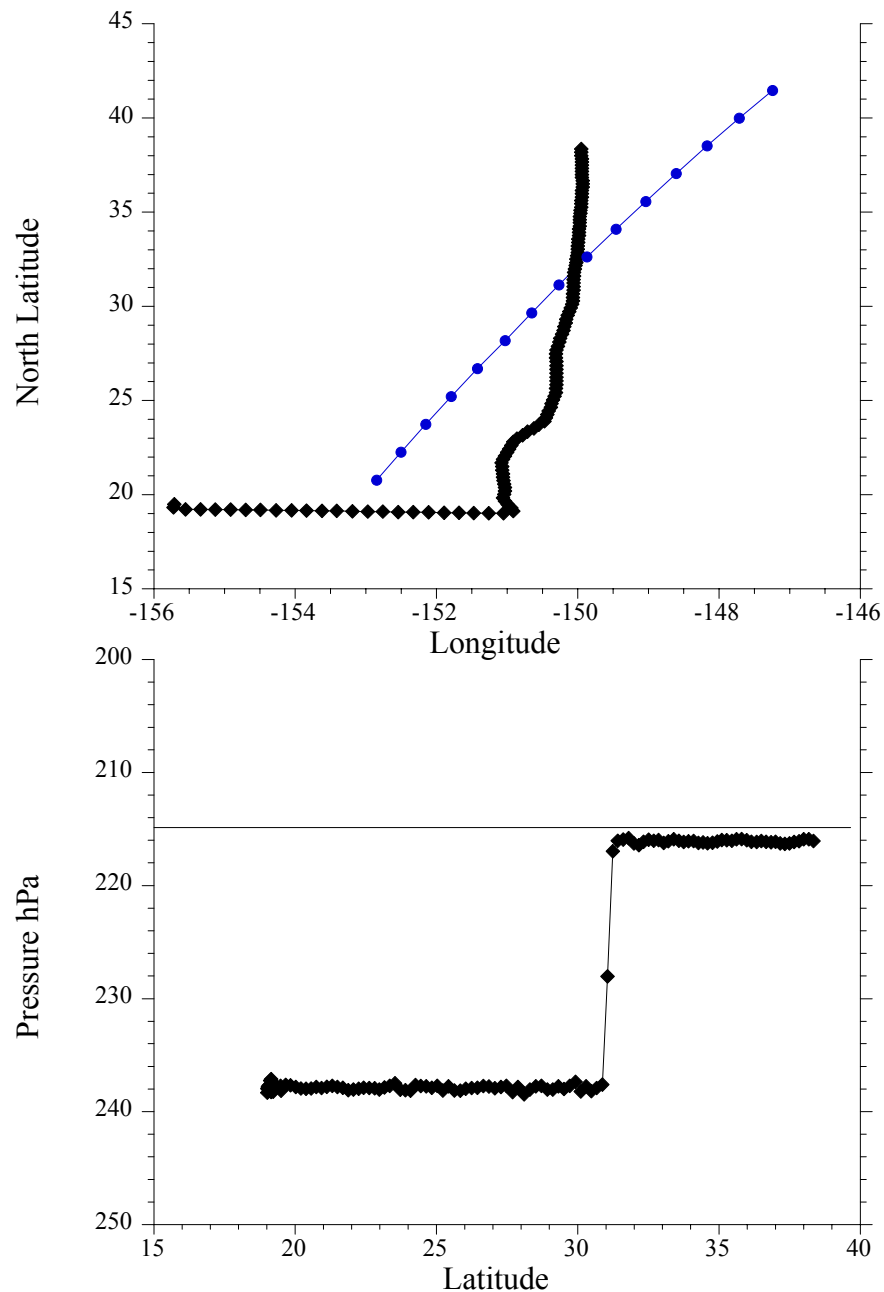




Brand new stuff! Preliminary INTEX B data compared to MLS V2.1 retrievals produced Friday.

Very little HNO<sub>3</sub> observed by the DC-8 in mid-troposphere near HI this day. MLS at 215 hPa sees more, but agrees within uncertainty.

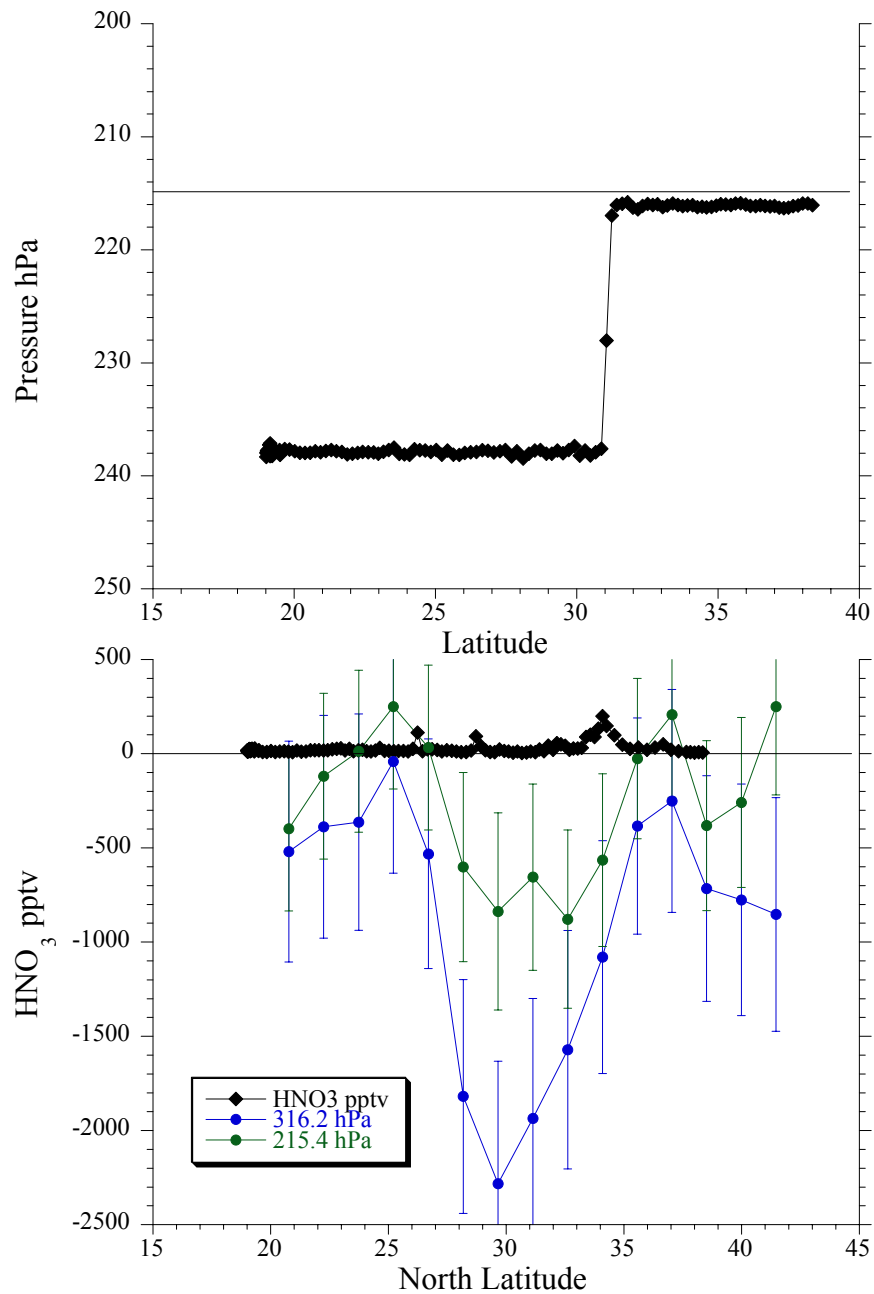
Retrieval at 316 hPa < 0 again.



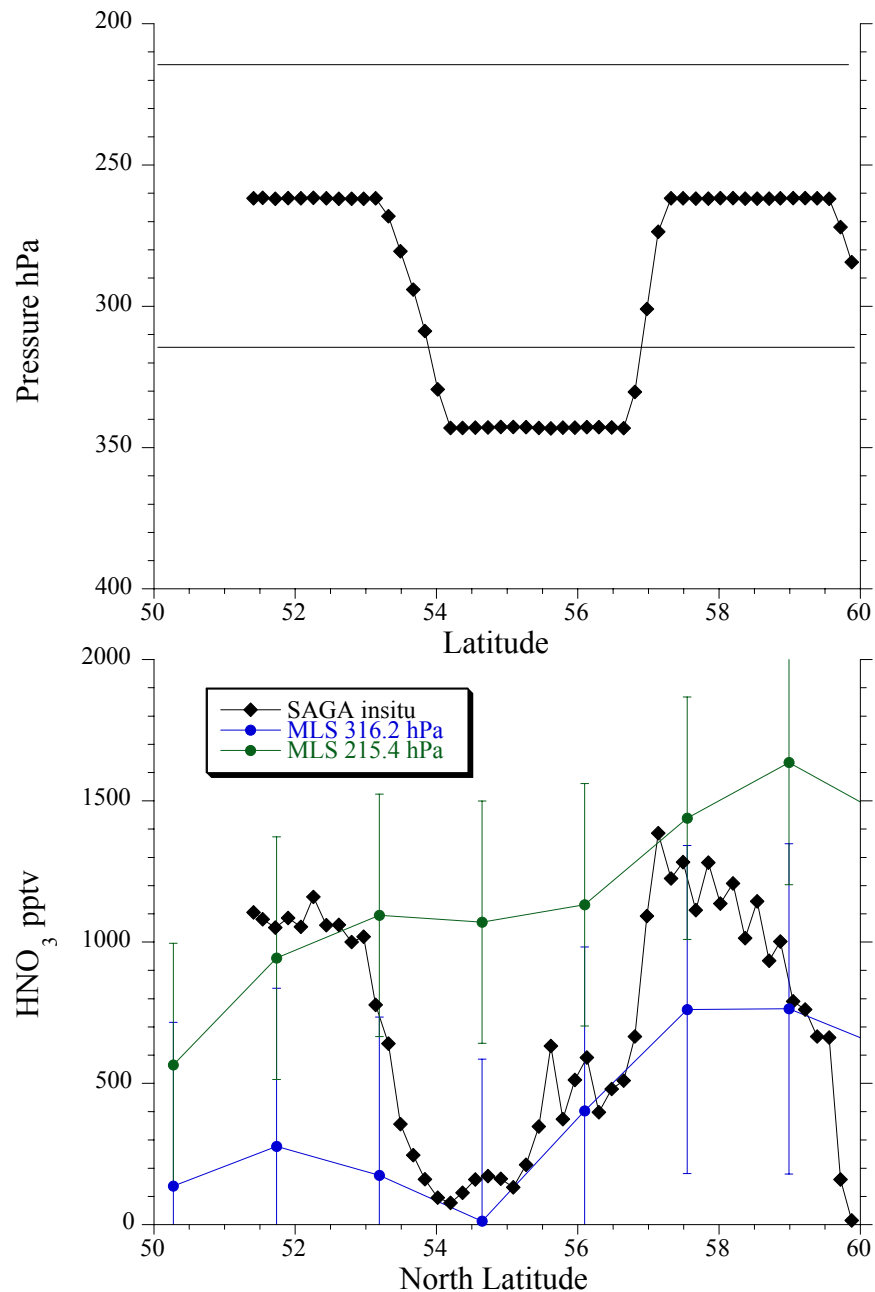
This flight (HI to AK) on 1 May was primarily for HIRDLS validation. The MLS track on a descending leg early in the flight was nearby.

Note that the DC-8 descended to the MBL just north of last point shown. (Supposed to be for TES validation? Maybe I should look at a different segment of MLS data? It was a long flight.)

Closer to AK we got in and out of the stratosphere, much more structure in  $\text{HNO}_3$ .



Again, not much HNO<sub>3</sub> in this region.  
In this sense MLS agrees, but  
negative values hard to understand.



INTEX B flight 16 on 7 May.

Very encouraging, at both levels!

Will V2.1 look as good on the other flights out of AK?  
If yes, what is different between PAVE and INTEX B?